University of Connecticut

Energy and Technology Committee

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Public Hearing

Testimony

By

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Good morning Chairman Senator Fonfara, Representative Nardello, Ranking Senator Witkos Representative Hoydick and members of the Energy and Technology Committee. My name is Prabhakar Singh and I am testifying in my role as the Director of the Center for Clean Energy Engineering and the UTC Chair Professor at the School of Engineering, University of Connecticut. I thank you for the opportunity to speak before you today regarding S.B. 23 *An Act Enhancing Emergency Preparedness and Response.*

Center for Clean Energy Engineering is a multidisciplinary center within the School of Engineering at the University of Connecticut. Our Center conducts cutting edge research in the areas of clean and efficient energy systems development, natural resource conservation, power management and "smart transmission." Our research efforts are directed towards the advancement of cost effective, sustainable and distributed generation technologies through programs that are focused on achieving reductions in cost and improvements in reliability and durability.

C2E2 collaborates with a broad range of national and international partners in the pursuit of excellence in education, training, innovation, research & development, systems engineering and demonstration. We work hand in hand with our CT industrial partners, such as UTC Power, FuelCell Energy, Sustainable Innovations, Northeast Utilities, Praxair, and many more to achieve advancements in systems testing, validation and deployment.

We are very excited about the proposed renewable distributed energy generation, and emergency preparedness and response program proposed by The Department of Energy and Environmental Protection for establishing a micro-grid grant and loan program to support critical infrastructure and facilities through local renewable distributed energy generation, transmission and management.

I am pleased to inform you that the University of Connecticut and the Center for Clean Energy Engineering is developing a distributed power generation and power management network at its Depot Campus to secure and support the existing network, educate students and reduce carbon foot print.

There are many tangible benefits for micro-grid generation:

- Incorporation of a variety of generation methods including
  - Solar
  - Geothermal
  - Wind
  - Microturbines
  - Fuel Cells
- Economies of scale that rely on modular manufacturing, rather than on-site large-scale manufacturing
- An increase in the use of renewable sources that will reduce the overall carbon footprint

Micro-grids can complement (not replace) traditional generation, transmission and distribution modes of power delivery

The generation of power in a distributed (local) mode can also increase the overall efficiency

- From reduced losses from transmission and distribution through an aging infrastructure
- Capture of thermal energy to provide heating and cooling

With recent storms, the need for distributed generation for critical infrastructure including:

- Command and control centers
- Water treatment plants
- Cooling/Heating centers
- Telecommunication networks

The distributed generation program can also stimulate the growth of sustainable energy industries in CT.

Connecticut is home to two of the largest and most successful fuel cell manufacturers in the world (including UTC Power and Fuel Cell Energy).

There are also a number of smaller but innovative companies (including Proton on Demand and PCI) that add to the fuel cell and hydrogen economy.

Together, they have achieved significant gains in durability and efficiency.

For example, high-temperature fuel cells have:

- continuous stack performance of more than 10 years
- combined heat and power efficiencies of 75%
- negligible emission of pollutants

Fuel cell technologies offer many other documented advantages as well, including

- fuel flexibility (natural gas, liquid fuels, biomass, etc.),
- ease of siting (low environmental hazards),
- and noiseless operation.

Several hundreds of these stand-alone fuel cell power generation systems (400kWe to 1.2 MWe) are in operation around the world

They reliably demonstrate:

- greater than 95% system availability (and are not intermittent like solar or wind)
- grid independent operation (to operate during power outages)
- and overall system durability in excess of 20 years.

At the Center for Clean Energy Engineering, faculty and industry partners have lead efforts to develop lower-cost fuel cell systems for distributed generation.

As part of this effort, UConn has pursued effective and near-term projects on materials development and manufacturing efficiency.

With the renewable distributed energy generation program and the on-going research partnerships with industry partners, UConn is ready to support efforts

- for resilient energy resources through the development of advanced materials and manufacturing
- that will lead to cost-effective deployment of micro-grids

Thank you.